



MEMORANDUM:

10 February 2002

TO: Ms. Magalie Roman Salas
Secretary
Federal Communication Commission
445 12th Street, S. W.
Washington, DC

FROM: Dr. Joe Ravenis

SUBJECT: RM-9375 and FCC 01-290

Dear Ms. Salas:

As one of the petitioners of RM-9375 Petition for Rule Making, which requested the amendment of Section 15.225 of the Commission's Rules, Cubic Corporation hereby removes its immediate support of RM-9375 and requests that it be delayed until quantitative interference analysis and other supporting technical data are provided to insure, guarantee, or at least eliminate the probability of interference of new systems being contemplated under the new petition with existing fielded systems in the 13.56 MHz +/- 7 kHz band and those in adjacent bands.

After the referenced petition was filed, discussions with other federal agencies and additional research have revealed the possibility of problems with the proposed emission levels. To date, these potential problems have not been adequately addressed nor technically resolved. Many of the potential concerns and problems have been qualitatively discussed and assumed insignificant. We applaud the FCC's request for comments on the FCC 01-290 document Notice of Proposed Rule Making and Order. It is only through open review and participation will the RF Spectrum be preserved for all to share.

Our comments will refer to certain rule sections contained in Part 15 of FCC Rules, specifically those that will modify the rules for Radio Frequency Identification Systems (RFID) in the 13.56 MHz +/- 7 kHz band. According to Section 19, FCC 01-290, the FCC defines a RFID System as a "tag mounted on an item to be identified, and a transmitter/receiver unit that interrogates the tag and receives identification data back from the tag. The tag may be a self-powered transmitter, or it may receive power from the interrogating transmitter." These are not the fundamental assumptions of the petition RM-9375 that was originally filed. The basic assumptions of RM-9375, as we proposed, was that the transmitter/receiver always talks first and is constantly transmitting. The tag is a passive device, is not a "self-powered" (i.e., it is batteryless), does not have the ability to transmit unless it is in the designated field (i.e., energy volume) of the interrogating transmitter. Unless these conditions are duly specified the limited research and supporting data behind the submitted petition also become suspect. If the stated conditions of Section 19, FCC 01-290 are to be utilized in the Rule Making and Order process, the supporters of petition RM-9375 and the agencies reviewing the petition should be made aware of the new operational features of the petition. In brief, having large numbers of tags

self-powered and transmitting will certainly raise the ambient interference level at many frequencies; you do not have to be an engineer to understand this situation. More about the interference issue later.

Cubic Corporation recommends that the FCC include the operational conditions of the tag and the transmitter and furthermore implement a mask that would maintain the field strength to 29.5 dBuV/m at 30 meters outside the sub band 13.56 MHz +/- 150 kHz and adheres to Section 15.205 of the Commission's rule permitting on spurious emissions in designated restricted frequency bands, which is in agreement with the NTIA/IRAC proposal. Furthermore, the field strength within the 13.56 MHz +/- 150 kHz band be limited to a nominal level above 29.5 dBuV/m when technically proven that the level of interference is negligible or has a very low probability of interference.

Cubic Corporation and others in the RF industry have a substantial technology base in RF ticketing and security systems worldwide, which comply with and implement the existing FCC's 13.56 +/- 7 kHz regulations. These systems have met the existing FCC regulations of 29.5 dBuV/m at 30 meters outside of the sub band 13.56 MHz +/- 7 kHz and 80 dBuV/m within the stated sub band. The RF technology to build communication systems to the FCC Regulations exists and is neither difficult nor unattainable. These systems have been in full operation commercially for over three years.

The first request for relaxation of the FCC Regulations was for an overall increase in signal level of 84 dBuV/m from 80 dBuV/m within the requested band and 50.5 dBuV/m from 29.5 dBuV/m within the HF band even beyond the into the VHF and UHF spectrum. The request gave no consideration to the existence of any other sub bands, much less the adjacent Astronomy or FAA bands. When the Telecommunication community did not accept this request another was proposed without ample technical justification nor interference analysis.

The second request was to continue to press for the 84 dBuV/m peak within the 13.56 MHz +/- 7 kHz band and still request the overall increase in signal level of 40.5 dBuV/m within the HF band and even beyond into the UHF and VHF spectrum. Furthermore, the request was to continue to increase the FCC signal level to 50.5 dBuV/m within the sub band 13.56 MHz +/- 7 kHz (i.e., 13.56 +/- kHz) again ignoring the Astronomy and FAA bands. When this request was again not accepted, another compromise was proposed without technical justification nor adequate interference analysis.

The third request, which is the one currently being reviewed, was to continue with the 84 dBuV/m peak within the 13.56 MHz +/- 7 kHz sub band and still request the overall increase in signal level of 40.5 dBuV/m not only within the HF band 13.11 to 14.01 MHz but also increased the signal level to 50.5 dBuV/m within the 13.41 to 13.71 MHz (i.e., 13.56 +/- 150 kHz) and as before ignoring the adjacent Astronomy and FAA bands.

As stated earlier, these requests are devoid of documented interference analysis or consideration of the impact of the proliferation of transmitting devices and future self-powered tags. Therefore, this request should be re-visited and delayed until sufficient technical and conclusive evidence and interference analysis be submitted and attached to the petition. Cubic Corporation supports the IRAC position where they would entertain a change that would raise the limit within the band 13.41 to 13.71 MHz while maintaining the section 15.209 general limits outside of that band. The appropriate signal level increase inside the 13.41 to 13.71 MHz band is yet to be theoretically or empirically validated. Nothing has been said about the two FAA bands and others within the proposed +/- 450 kHz band, therefore the FAA position has not

been addressed herein because they have not published anything, to our knowledge, on their position.

With regard to Section 21, FCC 01-290, yes, NCITS states "...that RFID systems operating in accordance with proposed limits ARE NOT EXPECTED to cause interference to licensed radio services." Is the FCC Rule Making process based on expectations or technical analysis and measured results? Furthermore, the concern is not just radio services but also all systems operating in their respective bands. There will be a proliferation of devices and there will be an increase in interference levels, the question is what is tolerable to maintain the operating systems utilizing that spectrum band and other adjacent bands.

Another open issue is the status of the "9 dB shoulder issue", i.e., 9dBuA/m at 10 meters for 13.56 MHz +/- 0.15 MHz. Has it been resolved and the solution published?

With regard to Section 22, FCC 01-290, many manufacturers are very anxious to utilize the 13.56 MHz +/- 7 kHz ISM band for new and novel transmitting devices. The intent of the NCITS petition was for specific products being contemplated for contactless card standards. Now that the signal levels are being increased the band becomes a gold mine for multiple new devices and applications. Longer ranges and faster data rates are only two of the system parameters being investigated with the unlimited signal levels being proposed. Six manufacturers have indicated new products but they are only the tip of the ice berg. Along with the new products will come a substantial increase in the interference and ambient noise level within and outside the proposed bands. In fact, nothing has been stated about the effects spurious signals, harmonics, and intermodulation products of the new signal levels being proposed. As stated in Section 22, "SCS Corp. opposes the petition stating that the proposed changes will increase the probability of interference with other RFID systems." Cubic Corporation agrees with their comment and would add other transmitting devices and receivers also. The noise floor will definitely increase in the band that is why the new signal levels selected within and outside the band be selected with caution and justification. Once they are increased they will not return to the existing level. Cubic Corporation has witnessed this same type of progression in the ISM 915 +/- 13 Mhz band. A cautious approach would be to increase them marginally today and review and reevaluate the changes during the five-year review cycle.

With regard to Section 23, FCC 01-290, the rationale for adoption of the proposed emission levels are rather vague and inconclusive. "...are not likely..", "...we believe..", "...is low and can be mitigated... if it occurs.", "...public interest be best served.." are not sufficient evidence to modify our spectrum regulations. Technical rationale is requested and should be contained in the petition. Today the band is under control but with many new entries, which are anticipated, the interference and aggregated noise effects will drive those in the band today out of the band.

One final comment about this section, Cubic Corporation disagrees with the FCC proposal to remove the Astronomy 13.36 – 13.41 MHz from the restricted bands listed in Section 15.205. It is unfortunate that NTIA has agreed to give up their band, but that is their choice. We think it is worth protecting and a value to humanity. Is it possible for FCC to raise the limits in the 13.56 MHz +/- 7 kHz and adjacent band to be acceptable to NTIA and FAA? Do not agree to a petitioner's request by eliminating adjacent bands. If this is a normal FCC response to a petitioner, Part 15 and ISM bands will become the next target for regulation elimination. No do not remove the 13.36 – 13.41 MHz band from the restricted bands listed in Section 15.205.

With regard to Section 24, FCC 01-290, do not approve the tags with or without a transmitter. As stated earlier, the FCC defined tags as self-powered transmitters or tags as that may receive power from the interrogating transmitter. They are two totally different devices and require

different signal levels to operate. They should not be treated as equal and allowed to follow the same regulations. See Page 27, FCC 01-290, for additional reasons for requiring the tags to be part of the regulation process. If that is not the case and FCC allows the tags to be treated together or separately as there basic rational, then treat transmitters regulations the same. Provide regulations for transmitters that do not radiate just as you treat those that do. The NCITS Petition was predicated on the basis that the tags only responded to a transmitter when they were transmitting in the transmitter's defined operating volume and range, and the petition was not predicted on whether the tag was or was not transmitting. The RFID products should be fully tested when both the transmitter is transmitting and when tags are also transmitting data in its operating volume. Tags and transmitters are not to be independently tested. If this ambiguity of tags continues to exist, the FCC will be opening up the spectrum to uncontrollable transmitters without appropriate regulations. If powered tags are to be considered part of this regulation their battery, rated supply voltages, signal levels, etc. should be independently established and the tags should be labeled accordingly.

Other concerns that have surfaced during the submission of the petition are discussed in the following paragraphs. A European manufacturer performed a study that stated concerns about the density of transmitter sites in populated areas are of paramount importance for probability of interference. In the future, if one considers all of the systems cited in Section 22, FCC 01-290, as operational there will be many transmitters/tags in populated areas. The study concluded that for these services that even radiators on the level of the pr EN300 30 transit spurious limits will result in high probability of interference. The FCC 01-290 document lacks substantial interference analysis to mitigate the probabilities.

Health and safety concerns abound when the existing signal levels are increased to those being requested by the petition. It has been rumored but not verified that transmitters and tags operating in pilot systems have encountered adverse effects on pace makers. These conditions and situations need to be verified or at least empirically tested and validated. Where do the liability rest if this assertion is true? The manufacturer or the regulations which allow the signal levels.

Last but not least is the concern from US users and manufacturers who have purchased, designed, and installed systems that adhere to the current FCC Regulations and will experience interference from systems that are designed to the new signal levels being proposed. What recourse will the users and manufacturers of these RFID systems in full operation have when the FCC new regulations raises the noise floors and interference? What compensation and liability issues will FCC be prepared to address?

Harmonization is a noble goal but not to the detriment of the spectrum, which is a non-negotiable item. The US has a valid set of regulations at 13.56 MHz +/- 7 kHz, which are not very difficult to meet from an engineering design, fabrication, and operational implementation standpoint. The marketplace will attest to that. Cubic Corporation recommends that the FCC allow incremental changes to the regulations if they are needed and substantiated, but not arbitrarily desired by manufacturers seeking dominance of their products. The FCC Regulations have been in force for a long time and telecommunication technology is rapidly increasing that can adhere to the regulations. It will continue to improve and therefore the existing regulations should not be abandoned without adequate justification and analysis.

Yours truly,
Joseph VJ Ravenis II
Cubic Corporation
9333 Balboa Avenue

San Diego, CA 92123
Telephone: 858.627.4654
e-mail: joe.ravenis@cubic.com